

AMENDMENTS TO THE CLAIMS

Please amend Claims 1, 4, 7, 9-13, 15 and 16.

Please cancel Claims 2, 3, 8, 14 and 17-19.

Please add Claims 21-37.

1. (Currently amended) A method of electrochemically filling cavities on a wafer surface to form a substantially planar conductive layer, comprising the steps of:

applying a first cathodic current to form a first conductive layer on the wafer surface, the ~~first conductive layer~~ wafer having a ~~planar portion over~~ a first cavity and a ~~non-planar portion over~~ a second cavity, wherein the first cavity is ~~an unfilled cavity with~~ has the smallest width and the second cavity has ~~the next a~~ larger width [[after]] than the ~~smallest~~ first cavity, and wherein the first and the second cavities are less than 10 micrometers in width;

treating a surface of the first conductive layer by applying a first pulsed current anodic current waveform; [[and]]

applying a second cathodic current to form a second conductive layer on the first conductive layer, ~~the second conductive layer having a planar portion over both the first and second cavities; and~~

treating a surface of the second conductive layer by applying a second anodic current waveform,

wherein the second anodic current waveform has a longer duration than the first anodic current waveform.

2. (Canceled)

3. (Canceled)

4. (Currently amended) The method of claim 1, wherein the step of treating the surface of the first conductive layer prevents bump formation on the surface of the first conductive layer.

5. (Original) The method of claim 1, wherein the steps of applying first and second cathodic currents comprise applying DC voltage.

6. (Original) The method of claim 1, wherein the steps of applying first and second cathodic currents comprise applying AC voltage.

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Filed : January 30, 2004

7. (Currently amended) The method of claim [[11]] 1, further comprising ~~the step of~~ repeating the steps of treating and applying until all the cavities on the wafer surface are filled.

8. (Canceled)

9. (Currently amended) A method to electrochemically fill a plurality of cavities on a wafer surface comprising ~~the steps:~~

applying a first cathodic current to fill a first cavity and partially fill a second cavity with a first conductive layer on the wafer surface, the first cavity having a smaller width than the second cavity wherein the first cavity and the second cavity each include a width less than 10 micrometers;

applying a first anodic current waveform pulsed current to treat the first conductive layer, the first anodic current waveform comprising at least one anodic current pulse; [[and]]

applying a second cathodic current to fill the second cavity with a second conductive layer to form a substantially planar conductive layer over the first cavity and the second cavity; and

applying a second anodic current waveform to treat the second conductive layer, the second anodic current waveform comprising at least one anodic current pulse,

wherein the second anodic current waveform has a longer duration than the first anodic current waveform.

10. (Currently amended) The method of claim 9, wherein ~~the step of~~ applying the first cathodic current includes applying a cathodic DC waveform.

11. (Currently amended) The method of claim 9, wherein ~~the step of~~ applying the first cathodic current includes applying a cathodic [[DC]] AC waveform.

12. (Currently amended) The method of claim 9, wherein ~~the step of applying a pulsed current~~ the first anodic current waveform includes a plurality of anodic pulsed current pulses.

13. (Currently amended) The method of claim 12, wherein ~~the step of applying the plurality anodic pulsed current includes pulses~~ the anodic current pulses are each [[of]] approximately 1 second in duration.

14. (Canceled)

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15. (Currently amended) A method of electrochemically filling cavities on a wafer surface to form a substantially planar conductive layer, comprising:

providing a first cavity being an unfilled cavity with a smallest width and a second cavity having a [[next]] larger width than the first cavity, wherein the first and [[the]] second cavities are less than 10 micrometers in width, the method comprising;

applying a first cathodic current waveform to form a first conductive layer on the wafer surface, the first conductive layer having a planar portion over a first cavity and a non-planar portion over a second cavity, the first cavity being filled and the second cavity being unfilled;

treating the first conductive layer by applying a first anodic current waveform;
[[and]]

applying a second cathodic current waveform to form a second conductive layer on the first conductive layer, the second conductive layer having a planar portion over [[both]] the first and second cavities cavity; and

treating the second conductive layer by applying a second anodic current waveform,

wherein the second cathodic current waveform has a longer duration than the first cathodic current waveform and the second anodic current waveform has a longer duration than the first anodic current waveform.

16. (Currently amended) The method of claim 15, wherein the step of applying the first cathodic current includes applying a cathodic rectangular waveform.

17. (Canceled)

18. (Canceled)

19. (Canceled)

20. (Original) The method of claim 15, wherein the planar conductive layer is copper.

21. (New) The method of claim 1, wherein the step of applying the first cathodic current comprises forming the first conductive layer including a planar portion over the first cavity and a non-planar portion over the second cavity.

22. (New) The method of claim 1, wherein the step of applying the second cathodic current comprises forming the second conductive layer including a planar portion over both the first and second cavities.

23. (New) The method of claim 1, wherein the step of treating the surface of the second conductive layer prevents bump formation on the surface of the second conductive layer.

24. (New) The method of claim 1, wherein the second anodic current waveform includes a greater number of anodic current pulses than the first anodic current waveform.

25. (New) The method of claim 1, wherein the second cathodic current is applied for a longer time than the first cathodic current.

26. (New) The method of claim 9, wherein applying the second cathodic current includes applying a cathodic DC waveform.

27. (New) The method of claim 9, wherein applying the second cathodic current includes applying a cathodic AC waveform.

28. (New) The method of claim 9, wherein the second anodic current waveform includes a greater number of anodic current pulses than the first anodic current waveform.

29. (New) The method of claim 9, wherein the second cathodic current is applied for a longer time than the first cathodic current.

30. (New) The method of claim 9, wherein the second anodic current waveform includes a plurality of anodic current pulses.

31. (New) The method of claim 30, wherein the anodic current pulses are each approximately 1 second in duration.

32. (New) The method of claim 15, wherein the second cathodic current waveform is a cathodic rectangular waveform.

33. (New) The method of claim 15, wherein the first anodic current waveform includes a plurality of anodic current pulses of approximately 1 second in duration.

34. (New) The method of claim 15, wherein the second anodic current waveform includes a plurality of anodic current pulses of approximately 1 second in duration.

35. (New) The method of claim 15, wherein the second anodic current waveform includes a greater number of anodic current pulses than the first anodic current waveform.

36. (New) The method of claim 15, wherein applying the first cathodic current waveform comprises forming the first conductive layer including a planar portion over the first cavity and a non-planar portion over the second cavity.

37. (New) The method of claim 36, wherein the first cavity is filled and the second cavity is unfilled.